



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/967,176	09/28/2001	Shoaib Hasan Zaidi	01 P 15946 US	5941

25962 7590 06/06/2003
SLATER & MATSIL, L.L.P.
17950 PRESTON RD, SUITE 1000
DALLAS, TX 75252-5793

EXAMINER

STOCK JR, GORDON J

ART UNIT PAPER NUMBER

2877

DATE MAILED: 06/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

BEST AVAILABLE COPY

Office Action Summary	Application No.	Applicant(s)	
	09/967,176	ZAIDI, SHOAB HASAN	
	Examiner	Art Unit	
	Gordon J Stock	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, and 4-15 is/are rejected.
- 7) ☒ Claim(s) 3 and 16-22 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

BEST AVAILABLE COPY

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 September 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>4</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

BEST AVAILABLE COPY

Specification

1. A substitute specification excluding the claims is required pursuant to 37 CFR 1.125(a) because the specification filed on January 17, 2002 is missing pages 3, 7, 9 and 12.

A substitute specification filed under 37 CFR 1.125(a) must only contain subject matter from the original specification and any previously entered amendment under 37 CFR 1.121. If the substitute specification contains additional subject matter not of record, the substitute specification must be filed under 37 CFR 1.125(b) and must be accompanied by: 1) a statement that the substitute specification contains no new matter; and 2) a marked-up copy showing the amendments to be made via the substitute specification relative to the specification at the time the substitute specification is filed.

2. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: as for **claims 1-6**, the claimed subject matter that is lacking proper antecedent basis in the specification is the following: a reference alignment mark; the reference mark being detected with a first alignment mark; the reference mark being detected with a second alignment mark; forming a composite image from the first and second image by aligning the reference mark in the first and second image; wherein the reference mark comprises the first alignment mark. As for **claim 11**, the particular subject matter is: a computer integrated within either the optical tool or the wavefront sensing tool. As for **claims 16-22**, the particular subject matter is: of **claim 16** calculating a distance between the first and second alignment marks based upon the results of the step of determining the location of the first and second alignment marks;

BEST AVAILABLE COPY

Art Unit: 2877

of **claim 18** determining the location of a third alignment and creating an image of the third alignment mark; of **claim 19** creating a composite image of the image of the first and second alignment marks and the image of the third alignment mark; of **claim 21** the third alignment mark is in a layer underlying the first and second alignment marks.

Drawings

3. Figure 1A should be designated by a legend such as --Prior Art-- because only that which is old is illustrated, and the Fig. 1A is objected to for the following: the phrase, "CROSS SECTION SWOWN BELOW," should read --CROSS SECTION SHOWN BELOW--. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

4. The drawings and specification are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: 18 of Fig. 1c; 4 of Fig. 5a. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

5. The drawings are objected to because 9, the control logic, of Fig. 2 is not connected to 7, the stage. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

BEST AVAILABLE COPY

Art Unit: 2877

6. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "28" of Fig. 4a has been used to designate both the wafer surface and a piston deviation feature. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

7. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 4 to instrument 1 of Fig. 6; 30 and 8 of Fig. 5b. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

8. Claims 16 and 18 are objected to because of the following informalities: as for claim 16, the phrase, "be comparing," on line 12 should read --by comparing--; as for claim 18, the phrase, "the location of a third alignment and creating," should read --the location of third alignment mark and creating--. Appropriate correction is required.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

10. **Claims 1, 2, 4-5** are rejected under 35 U.S.C. 102(a) as being anticipated by **Templeton et al. (6,269,322)**.

BEST AVAILABLE COPY

As for **claims 1, 2, 4-5**, Templeton in a system and method for wafer alignment discloses the following: detecting the first alignment mark and a reference alignment mark using a first alignment tool and forming thereof a first image; detecting the second alignment mark and the reference mark using a second alignment tool and forming thereof a second image; forming a composite image from the first and second image by aligning the reference mark in the first and second image; wherein the step of detecting the second alignment mark comprises observing the mark with a microscope; wherein the reference mark comprises the first alignment mark (col. 7, lines 20-45; col. 9, lines 40-67; cols. 10-11); scanning the integrated circuit relative to the first and second alignment tools (col. 9, lines 1-11); the alignment marks are on differing layers (col. 12, lines 5-40).

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. **Claim 6** is rejected under 35 U.S.C. 103(a) as being anticipated by **Templeton et al. (6,269,322)** in view of **Nishi et al. (6,141,107)**.

As for **claim 6**, Templeton discloses everything as above (see **claim 1**). Templeton in addition discloses illuminating the wafer with a light source (Fig. 9, 130). He is silent concerning magnifying light. However, Nishi teaches in an apparatus for detecting an optical mark position that a microscope alignment system may comprise magnifying the images (col. 1,

BEST AVAILABLE COPY

lines 20-40). Therefore, it would be obvious to one skilled in the art at the time the invention was made that the system comprised magnifying the image of the marks for a microscope system is used.

13. **Claims 7-10** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Neal et al. (6,184,974)**—cited by applicant—in view of **McArthur et al. (6,356,345)** further in view of **Morokuma (5,369,488)** and **Chung et al. (5,843,831)**.

As for **claims 7-10**, Neal discloses a stage having a surface for receiving a wafer; a light source directed to illuminate the wafer having a predetermined wavelength; a beam splitter located to intercept light from said light reflected off a wafer and to split said reflected light into a first light path and second light path; an optical tool in the first light path; a wavefront sensing tool; a computer coupled to the wavefront sensing tool (Fig. 1d; col. 4, lines 45-50; col. 5, lines 30-50; col. 6, lines 45-65); a device for moving a semiconductor wafer placed on the stage in relation the optical tool and wavefront sensing tool, a translation stage (Fig. 1d, 24); the wavefront sensing tool is a Shack-Hartmann detector (col. 30, lines 30-35); as for the computer receiving alignment detection data and outputting an alignment image, Neal is silent. However, Neal teaches that the system is used in metrology applications (col. 1, lines 10-55). McArthur teaches in an in-situ source metrology instrument the production of alignment measurements and alignment images (cols. 4-6). Therefore, it would be obvious to one skilled in the art at the time the invention was made that the processor would receive alignment detection data and outputs alignment imaging for metrology applications involve alignment measurements and alignment images. As for coupling the computer to the other optical tool, Neal is silent. However, Chung in an alignment system teaches a microscope being coupled to a computer (col. 2, lines 5-10) and

Morokuma in a location-measuring device teaches that a position detector may be a microscope (col. 1, lines 25-30). Therefore, it would be obvious to one skilled in the art at the time that the position detector is a microscope, for position detecting microscopes are position detectors. Also it would be obvious to one skilled in the art at the time the invention was made to have the microscope be coupled to the computer in order to have computer analysis of the position detection data.

14. **Claim 11** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Neal et al. (6,184,974)**—cited by applicant—in view of **McArthur et al. (6,356,345)** further in view of **Morokuma (5,369,488)** and **Chung et al. (5,843,831)** and further in view of **Lin et al. (6,091,846)**.

As for **claim 11**, Neal in view of MacArthur, Morokuma, and Chung discloses everything as above (see **claim 7**). However, they are silent concerning integration of a computer with either optical tool. Lin in a system for detecting anomalies teaches integrating the computer with the microscope (Fig. 2). Therefore, it would be obvious to one skilled in the art at the time the invention was made to have the computer integrated with the microscope in order to decrease the size of the instrument.

15. **Claims 12-15** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Neal et al. (6,184,974)**—cited by applicant—in view of **McArthur et al. (6,356,345)** further in view of **Morokuma (5,369,488)** and **Chung et al. (5,843,831)** and further in view of **Hasegawa et al. (6,266,130)**.

As for **claims 12-15**, Neal in view of McArthur, Morokuma, and Chung discloses everything as above (see **claim 7**). They are silent concerning particular alignment feature

Art Unit: 2877

characteristics that do not concern solely infrared (as Chung). Hasegawa teaches in a position detecting method and system that the alignment features for position detection may comprise at least one mark on the surface of the wafer formed on a photoresist and formed on a layer beneath the surface of the wafer (Fig. 4, col. 8, lines 43-60). Therefore, it would be obvious to one skilled in the art that the alignment system has an alignment feature comprising a photoresist on the surface of the wafer and formed on a layer beneath the surface of the wafer, for alignment features are formed on photoresists and on layers beneath the surface of the wafer and alignment features are necessary in order to provide imaging for alignment measurements. As for the height being less than one fourth of a wavelength, it would have been an obvious matter of design choice to have the height be less than one fourth of a wavelength since such a modification would have involved a mere change in the size of a component. A change in size is generally recognized as being within the level of ordinary skill in the art. In re Rose, 105 USPQ 237 (CCPA 1955).

Allowable Subject Matter

16. **Claim 3** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

As to **claim 3**, the prior art of record, taken alone or in combination, fails to disclose or render obvious in a method of detecting the alignment of two layers in an integrated circuit the step of detecting the first alignment mark comprises observing the integrated circuit with a wavefront sensing tool, in combination with the rest of the limitations of **claim 3**.

BEST AVAILABLE COPY

17. **Claim 16** is objected to (see above objection), but would be allowable if rewritten to overcome the objection above.

Claims 17-22 are objected to as being dependent upon an objected base claim, but would be allowable if claims 16 and 18 are rewritten to overcome the objections as stated above.

As to **claim 16**, the prior art of record, taken alone or in combination, fails to disclose or render obvious in a method for measuring the overlay alignment of at least two layers of a semiconductor device using a wavefront sensing tool generating a reference signal by observing a flat reference surface with the wavefront sensing tool and storing the resulting signal; aligning at least a portion of the semiconductor wafer containing a first and second alignment mark with the wavefront sensing tool; generating a wavefront slope signal by observing the magnified reflected wavefront of light with the wavefront sensing tool, in combination with the rest of the limitations of **claim 16-22**.

Conclusion

18. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

U.S. Patent 4,545,684 to Kuroki et al.

U.S. Patent 5,114,235 to Suda et al.

U.S. Patent 5,481,363 to Matsugu et al.

U.S. Patent 6,462,818 to Bareket

Fax/Telephone Numbers

If the applicant wishes to send a fax dealing with either a proposed amendment or a discussion with a phone interview, then the fax should:

BEST AVAILABLE COPY

1) Contain either a statement "DRAFT" or "PROPOSED AMENDMENT" on the fax cover sheet; and

2) Should be unsigned by the attorney or agent.

This will ensure that it will not be entered into the case and will be forwarded to the examiner as quickly as possible.


Papers related to the application may be submitted to Group 2800 by Fax transmission. Papers should be faxed to Group 2800 via the PTO Fax machine located in Crystal Plaza 4. The form of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The CP4 Fax Machine number is: (703) 308-7722

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gordon J. Stock whose telephone number is (703) 305-4787. The examiner can normally be reached on Monday-Friday, 10:00 a.m. - 6:30 p.m.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

gs

June 2, 2003


Zandra V. Smith
Primary Examiner
Art Unit 2877

BEST AVAILABLE COPY